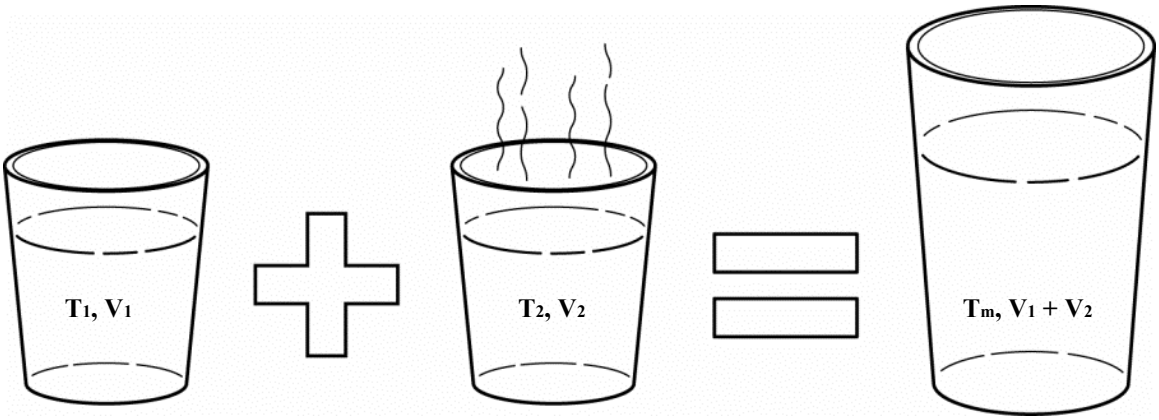
Mix It Up:
Combining Liquids of Different Temperature

Suppose that a hot drink and a cold drink are mixed together and you would like to predict the temperature of the mixture. To do this, you need to know the temperatures of the drinks before they are mixed, $\mathbf{T}_1$ and $\mathbf{T}_2$, and the volumes of each used in the mixture, $\mathbf{V}_1$ and $\mathbf{V}_2$. A visual representation of the problem is shown below, where $\mathbf{T}_m$ represents the temperature of the mixture:



Translated into mathematical symbols, we have

$$\mathbf{T_1V_1 + T_2V_2 = T_m(V_1 + V_2)}$$

In this activity you will use the concepts described above to predict the resulting temperature when two solutions of different temperatures are mixed. The data needed to perform these calculations will be collected using a pair of Temperature Probes.

PROCEDURE

1. Connect the Temperature Probes to the computer.
2. To test the expression $\mathbf{T_1V_1 + T_2V_2 = T_m(V_1 + V_2)}$, you will record the temperature of water in two cups and then find the temperature when the contents of the cups are mixed together.
3. You have two cups, one labeled and filled with Cold Water and the other labeled and filled with Hot Water.
4. Put the probe 1 in Cold Water Cup, and probe 2 in Hot Water Cup 2. Observe the temperature readings. When the readings are stable stop the data collection. Store these by clicking on Experiment and Selecting Store Latest Run.
5. Work quickly through the next steps.
    a. Remove the Temperature Probe from Cold Water Cup and set it aside.
    b. Quickly pour the contents of Cold Water Cup into Hot Water Cup, keeping the probe in Hot Water Cup.
    c. Watch the temperature reading for Temperature 2. When it stops changing, stop the data collection and Store Latest Run.
    d. Remove the probe from the water.